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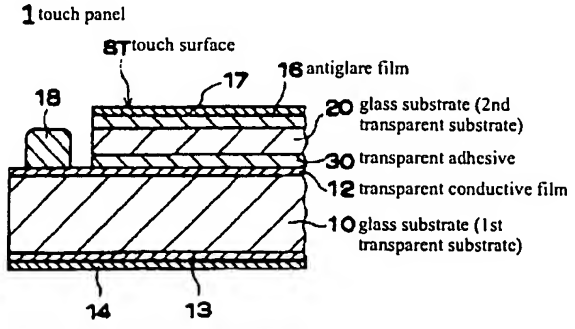
(54) **[Title of the invention]** Capacitance type touch panel

(57) **[Summary]**
[Objective] This invention concerns capacitance type touch panel which is utilized for such as the means to enter coordinate, and its objectives are prevention of damages to transparent conductive film and enabling improvement productivity, as well.
[Constitution] It is structured that the second transparent substrate 20 for antiglare is laminated using transparent adhesive 30 on the touch surface ST of the first transparent substrate 10 which is provided with transparent conductive film 12 for detecting touched position.

Cross sectional drawing of major part showing structure of a touch panel concerning the 1st embodiment example of this invention.



[Claims]

[Claim 1] Capacitance type touch panel which is characterized by being composed that touch surface (ST) side of the first transparent substrate (10, 11) being provided with a transparent conductive film (12) for touch position detection is adhered to the second transparent substrate (20, 20B, 21, 21B) for glare prevention, with transparent adhesive (30).

[Claim 2] Capacitance type touch panel which is described in Claim 1 and is characterized that said second transparent substrate (20B, 21B) comprise a glass plate of which surface of touch surface (ST) side is roughened.

[Detailed explanation of the invention]

[0001]

[Application field in industry] This invention concerns capacitance type touch panel which is utilized for such as the means to enter coordinate.

[0002] Touch panels have been widely used for such as input means for selecting choices being displayed on a monitor display of ATM (Automatic Teller Machine) for example. ATM's are often installed in environments of wind and dust similar to outdoor. Therefore, touch panels being excellent in durability and low cost have been desired.

[0003]

[Prior technology] A capacitance type touch panel is constituted by providing a transparent conductive film on entire surface of glass substrate (transparent substrate) having specific surface resistance, and it is mounted in front of a monitor display such as CRT monitor for use.

[0004] On fringes of the transparent conductive film, electrode terminals are provided in a constant pitch and the transparent conductive film and touch position detection circuit are connected through these electrode terminals. When an arbitrary point (coordinate) is contacted (touched) with such as a finger, the transparent conductive film is grounded through static capacitance of human body and a change in resistance value is generated at each electrode terminal and grounding line. This change is detected by the touch position detection circuit and the coordinate on the display monitor is entered by this.

[0005] Figure 5 is cross sectional drawing of major part showing structure of a previous touch panel 1j. A transparent conductive film 12 which functions as the touch position detection element is provided to uniformly cover the surface (upper surface in the drawing) of glass substrate 10 which is the base structure, in the touch panel 1j, and electrode terminals 18 are formed on the transparent conductive film 12 at the end of the glass substrate 10 for electrical connection with outside detection circuit which is not shown in the drawing.

[0006] And except for the region where the electrode terminals 18 are formed, intermediate protective film 15, antiglare film (glare prevention film) 16 and protective film 17 are formed on the transparent conductive film 12 in this order. Surface of the protective film 17 is the touch surface ST.

[0007] The antiglare film 16 is a porous film which is obtained by baking of water glass. The protective film 17 is provided to prevent loss of transparency of the antiglare film 16 because of moisture, and it comprises magnesium fluoride, for example. The intermediate protective film 15 is provided for suppressing degradation of the transparent conductive film 12 during baking of the antiglare film 16, and it comprises silicon dioxide film by vapor coating or sputtering.

[0008] On the other hand, a transparent conductive film 13, which is shield electrode for eliminating the effect of noise from display device, is provided on the back surface of the glass substrate 10, and this transparent conductive film 13 is also covered with a protective film 14 comprising silicon dioxide.

[0009]

[Problems to be solved by this invention] There has been a problem that the transparent conductive film 12 is scraped off along with such as the protective film 17 and it is easy to cause damages which can be a cause of wrong input with previous touch panel 1j, when input operation is done in a condition that hard particles such as sand dust is attached to the touch surface ST, for example, because the total film thickness of three films which cover the transparent conductive film 12 is about thousands of Å.

[0010] Also, there has been a problem that because it is in a structure that all of the total 6 films including the transparent conductive film 12 are formed using single glass substrate 10 as supporting body (film forming substrate), at least 4 times of film forming must be done in sequence even similar quality films are formed simultaneously, and it takes long time.

[0011] Considering above described problems, the objectives of this invention are to : prevent damages to the transparent conductive film and to enable improvement of productivity, as well.

[0012]

[Means to solve the problems] In order to solve above problems, the panel concerning the invention of Claim 1 is composed that touch surface ST side of the first transparent substrate 10 and 11 being provided with a transparent conductive film 12 for touch position detection is adhered to the second transparent substrate 20, 20B, 21 and 21B for glare prevention, with transparent adhesive 30, as shown in Figure 1.

[0013] The panel concerning the invention of Claim 2 is composed that said second transparent substrate 20B and 21B comprise a glass plate of which surface of touch surface (ST) side is roughened.

[0014]

[Function] The transparent conductive film 12 is mechanically and chemically protected with the second transparent substrate 20, 20B, 21, and 21B.

[0015] Production time of the touch panels 1, 2, 3 and 4 is able to be reduced because film forming of the transparent conductive film 12 on the first transparent substrate and film forming on the second transparent substrate or working on the substrate itself may be done simultaneously.

[0016] If glare prevention is done by roughening of the surfaces of the second transparent substrates 20B and 21B, forming of antiglare film 16 and protective film 17 is not necessary to make production process simpler and structure of entire touch panel simpler.

[0017]

[Embodiment examples] Figure 1 through Figure 4 are cross sectional drawing of major part showing structure of touch panels concerning 1st through 4th embodiment examples, respectively. In these drawings, composing elements having identical functions with Figure 5 are applied with identical numbers regardless the difference in shapes and relative locations with other composing elements.

[0018] In Figure 1, the touch panel 1 is composed by laminating a glass substrate 10 being provided with transparent conductive film 12 which functions as the touching position detection element, transparent conductive film 13 which functions as shielding electrode, protective film 14 and electrode terminals 18, and a glass substrate 20 being provided with antiglare film 16 and protective film 17, with transparent adhesive 30 such as epoxy resin. Which means that the touch panel 1 has a double layer substrate structure.

[0019] Thickness of the glass substrate 10 is made to be around 3 or 4 mm and thickness of the glass substrate 20 is made to be about 1 mm. Further, size of the glass substrate 10 is selected to be larger than the glass substrate 20 for the forming region of the electrode terminals 18.

[0020] The transparent conductive film 12

and 13 are ITO film of film thickness around 400 Å comprising indium oxide as the major component and a few percent of tin oxide, for example, and is formed by vapor coating or sputtering.

[0021] Further, film thickness of the protective film 14, antiglare film 16 and protective film 17 are around 1000 to 2000 Å for each, and thickness of the layer comprising transparent adhesive between the transparent conductive film 12 and the glass substrate 20 is around 10 μm.

[0022] With the touch panel 1 in above structure, the transparent conductive film 12 is protected with sufficiently thick and hard glass substrate 20 at input operation using the surface of the protective film 17 as the touching surface ST, therefore, it is able to securely prevent damages which is the cause of malfunction.

[0023] Further, because it is able to conduct forming of the antiglare film 16 and protective film 17 on the glass substrate 20 in parallel with the forming of such as the transparent conductive film 12 on the glass substrate 10, it is able to produce in shorter time compared to the touch panel 1j which is in previous single plate structure.

[0024] In Figure 2, touch panel 2 is structured by laminating a glass substrate 20B to the glass substrate 10, in place of the glass substrate 20 of the touch panel 1 in Figure 1.

[0025] Upper surface of the glass substrate 20B is made to be the touch surface ST and this touch surface ST is roughened by sand blasting method, for example, for glare prevention. In Figure 3, the touch panel 3 is constructed by laminating about 1 mm thick glass substrate 11 being provided with a transparent conductive film 12 and electrode terminals 18 and about 3 mm thick glass substrate 21 being provided with an antiglare film 16 and its protective film 17, with transparent adhesive 30, so that non-film-forming side of each opposes.

[0026] In the touch panel 3, the touch surface ST is exposed side of the glass substrate 21, namely the surface of protective film 17. Where, the touch panel 3 is suitable for the use in combination with a display unit which is less prone to generate noise such as LCD panel, for example, because it does not have a transparent conductive film which functions as a shield electrode.

[0027] In Figure 4, touch panel 4 is structured by laminating a glass substrate 20B, of which surface to be used as the touch surface ST is roughened, is a glass substrate 11, in place of the glass substrate 21 of the touch panel 3 of Figure 3.

[0028] According to above described embodiment examples, shattering of broken pieces is prevented even if strong impact is applied on the touch surface ST (such as the case when strongly pounding the touch surface ST), for example, and the glass substrate is broken, because it is in a structure that the glass substrate 10 and the glass substrate 20, 20B, 21, or 21B are tightly adhered with relatively highly viscous transparent adhesive 30. Which means that the touch panels 1, 2, 3, and 4 are safer at breakage compared to previous touch panel 1j.

[0029] In above described embodiment examples, reduction of input sensitivity due to the increase of distance between the transparent conductive film 12 and touch surface ST is able to be compensated by increasing signal amplification gain of the detection circuit.

[0030] Although touch panels 1, 2, 3 and 4 of combination of two pieces of glass substrate which are mutually different in thickness in above described embodiment examples, first glass substrate as the film-forming substrate for the transparent conductive film 12 and the second glass substrate for glare prevention may be made in the same thickness.

[0031]

[Effect of the invention] According to this invention, it is able to securely prevent damages to the transparent conductive film,

and also is able to improve the productivity by simultaneous forming of various films which use each of transparent substrates as a supporting body, as well.

[0032]

[Brief explanation of drawings]

[Figure 1] Cross sectional drawing of major part showing structure of a touch panel concerning the 1st embodiment example of this invention.

[Figure 2] Cross sectional drawing of major part showing structure of a touch panel concerning the 2nd embodiment example of this invention.

[Figure 3] Cross sectional drawing of major part showing structure of a touch panel concerning the 3rd embodiment example of this invention.

[Figure 4] Cross sectional drawing of major part showing structure of a touch panel concerning the 4th embodiment example of this invention.

[Figure 5] Cross sectional drawing of major part showing structure of a previous touch panel.

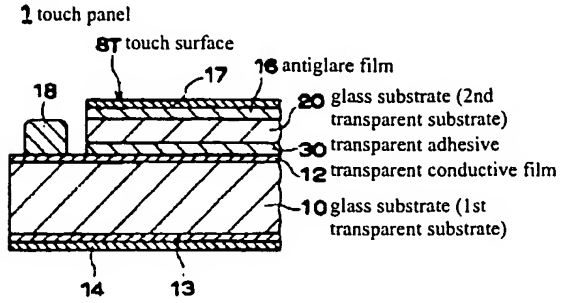
[Description of numbers]

1, 2, 3, 4: touch panel (capacitance type touch panel)
12: transparent conductive film
10, 11: glass substrate (first transparent substrate)
20, 20B, 21, 21B: glass substrate (second transparent substrate)
ST: touch surface
30: transparent adhesive

Translated by: Hideyo Sugimura, 651-490-0233, hsugimura@pipeline.com, March 9, 2004

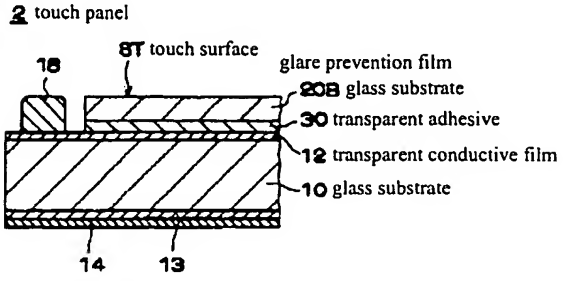
[Figure 1]

Cross sectional drawing of major part showing structure of a touch panel concerning the 1st embodiment example of this invention.



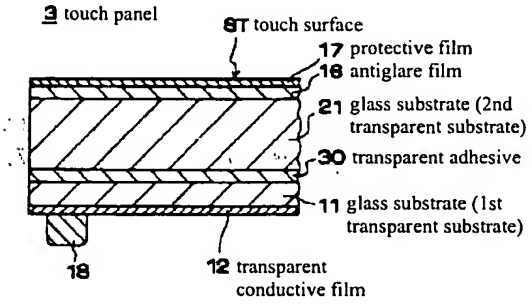
[Figure 2]

Cross sectional drawing of major part showing structure of a touch panel concerning the 2nd embodiment example of this invention.



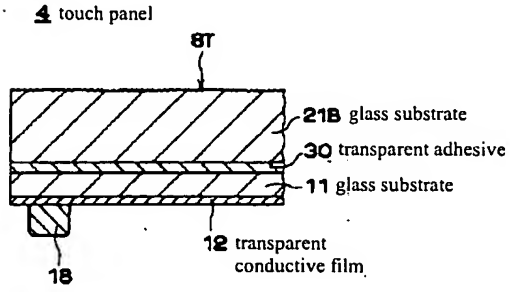
[Figure 3]

Cross sectional drawing of major part showing structure of a touch panel concerning the 3rd embodiment example of this invention.



[Figure 4]

Cross sectional drawing of major part showing structure of a touch panel concerning the 4th embodiment example of this invention.



[Figure 5]

Cross sectional drawing of major part showing structure of a previous touch panel.